

SRB CRITICAL ITEMS LIST

SUBSYSTEM: STRUCTURES & MISCELLANEOUS ITEMS

ITEM NAME: TVC APU Turbine Exhaust Duct

PART NO.: 10206-0010-101

FM CODE: A01

ITEM CODE: 60-02-06

REVISION: Basic

CRITICALITY CATEGORY: 1

REACTION TIME: Immediate

NO. REQUIRED: 2

DATE: March 1, 2002

CRITICAL PHASES: Boost

SUPERCEDES: March 31, 1998

FMEA PAGE NO.: E-14

ANALYST: Reynolds/S. Parvathaneni

SHEET 1 OF 2

APPROVED: S. Parvathaneni

CN 044

FAILURE MODE AND CAUSES: Structural failure of exhaust duct caused by:

- o Aerodynamic loading combined with Improper Fabrication, Improper Material, Improper Installation or Improper Assembly.

FAILURE EFFECT SUMMARY: Loss of mission, vehicle and crew due to loss of vehicle control.

RATIONALE FOR RETENTION:

A. DESIGN

- O The TVC APU Turbine Lower Exhaust Duct is constructed by forming and welding Inconel sheet stock to form a flared tube. A flange is welded on to interface with the TVC middle exhaust system.
- O The materials used in the design were selected in accordance with 10PLN-0150 (Materials Control and Verification Program Management Plan for SS SRB Program) and MSFC-SPEC-522 (Design Criteria for Controlling Stress Corrosion Cracking). CN 044
- O The design allowables are in compliance with MIL-HDBK-5 (Metallic Materials and Elements for Aerospace Vehicle Structures) and MSFC-HDBK-505 (Structural Strength Program Requirements).
- O The welding is in compliance with MSFC-SPEC-135 (Welding, Fusion). Weld wire controls are in compliance with MSFC-SPEC-655 (Standard Weld Filler, Control of).
- O All welds are 100% radiograph inspected in accordance with MIL-STD-453 (Military Standard, Inspection, Radiographic).
- O Qualification of the TVC exhaust duct was by analysis as documented in Certificate of Qualification A-TVC-4119.

- O Analysis shows that a design factor of safety of +2.0 (yield) exists between the duct and the predicted maximum loading during ascent. (Ref: BPC-ANAL-003-87).

B. TESTING

- O No testing is performed during each flow applicable to this failure mode.

C. INSPECTION

VENDOR RELATED INSPECTION

- O USA SRBE SIP 1341 controls the USA SRBE QAR inspection criteria at the vendor's facility. (Improper Fabrication)
- O Material certifications are verified by USA SRBE QAR per SIP 1341. (Improper Material)
- O Welds are one hundred percent X-rayed per MIL-STD-453. This is verified by USA SRBE QAR per SIP 1341. (Improper Fabrication)

Critical Processes/Inspections:

- O Radiographic inspection operations are performed per MIL-STD-453. (Improper Fabrication)
- O Welding was performed per MSFC-SPEC-135. (Improper Fabrication)

ASSEMBLY/CHECKOUT RELATED INSPECTIONS

- o Assembly of the exhaust duct is performed. Torque witness verification is by USA SRBE QA. Witness verification of heat seal installation and final duct installation is by USA SRBE QA, in accordance with 10REQ-0021, para 2.1.4 (Improper Installation).
- o Final installation of the exhaust duct is performed. Assembly and installation includes witness verifications by USA SRBE Quality of proper torque requirements and installation, in accordance with 10REQ-0021, para. 2.1.4 (Improper Installation).

D. FAILURE HISTORY

- O Criticality Category 1:
 - o Failure histories maybe obtained from the PRACA data base.

E. OPERATIONAL USE

- o Not applicable to this failure mode.